Active Safety Technology – How Big is the Safety Benefit?

National Highway Traffic Safety Administration

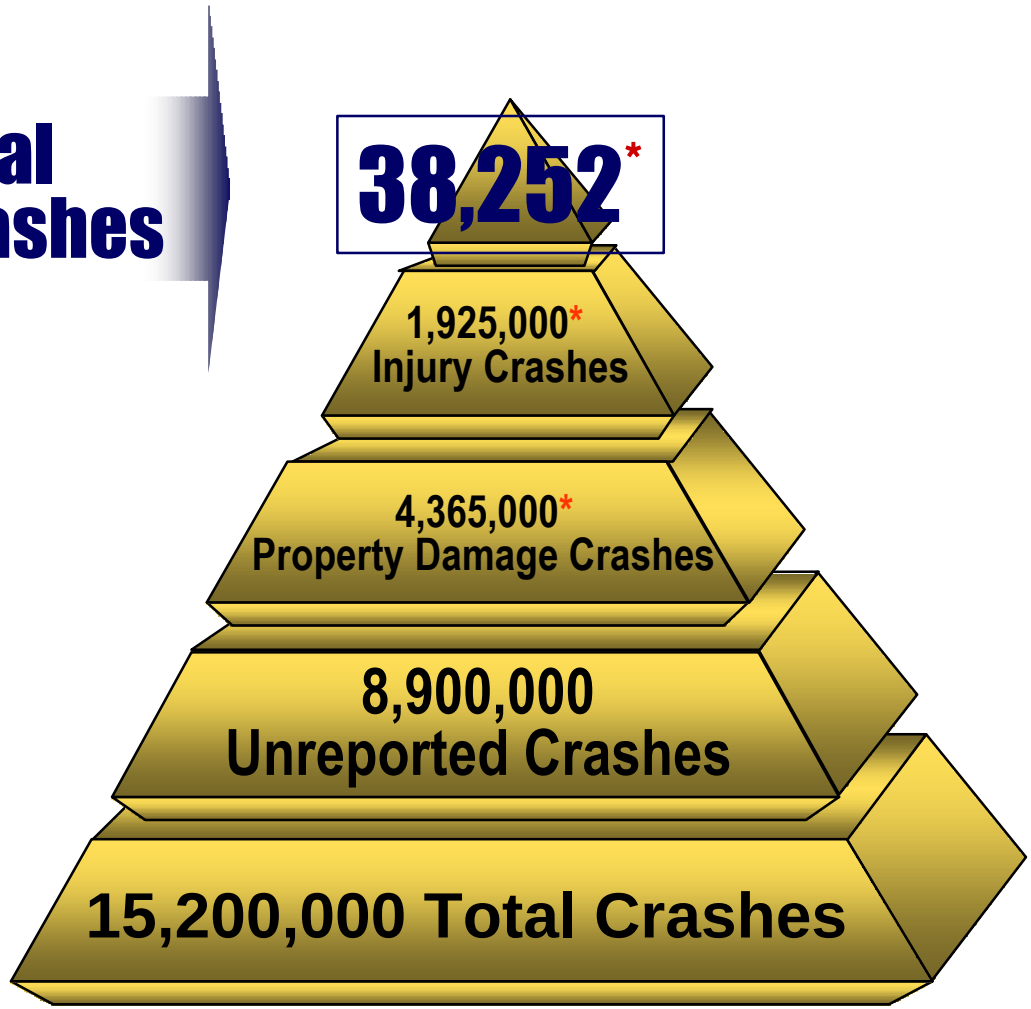
Ron Medford

2004

People Saving People

www.nhtsa.dot.gov

The Crash Epidemic



42,643 Fatalities (2003)

*Police-Reported

Economic Cost of Crashes in US

- **$230 billion total**
  - $32 billion medical cost
  - $51 billion for impaired driving
  - $20 billion failure to use belts

Top 10 Leading Causes of Death in the United States for 2001, by Age Group

RANK	Cause and Number of Deaths											Years of Life Lost
	Infants Under 1	Toddlers 1-3	Young Children 4-7	Children 8-15	Youth 16-20	Young Adults 21-24	Other Adults			Elderly 65+	All Ages	
							25-34	35-44	45-64			
1	Perinatal Period 13,734	Congenital Anomalies 496	MV Traffic Crashes 533	MV Traffic Crashes 1,546	MV Traffic Crashes 5,979	MV Traffic Crashes 4,136	MV Traffic Crashes 6,759	Malignant Neoplasms 16,569	Malignant Neoplasms 139,785	Heart Disease 582,730	Heart Disease 700,142	Malignant Neoplasms 23% (8,614,131)
2	Congenital Anomalies 5,513	MV Traffic Crashes 421	Malignant Neoplasms 400	Malignant Neoplasms 829	Homicide 2,414	Homicide 2,738	Homicide 5,204	Heart Disease 13,326	Heart Disease 98,885	Malignant Neoplasms 390,214	Malignant Neoplasms 553,768	Heart Disease 22% (8,110,571)
3	Heart Disease 479	Accidental Drowning 393	Exposure to Smoke/Fire 178	Suicide 447	Suicide 1,879	Suicide 1,924	Suicide 5,070	MV Traffic Crashes 6,891	Stroke 15,518	Stroke 144,486	Stroke 163,538	MV Traffic Crashes 5% (1,700,952)
4	Homicide 332	Homicide 362	Congenital Anomalies 168	Homicide 391	Malignant Neoplasms 814	Accidental Poisoning 771	Malignant Neoplasms 3,994	Suicide 6,635	Diabetes 14,913	Chronic Lwr. Resp. Dis. 106,904	Chronic Lwr. Resp. Dis. 123,013	Stroke 5% (1,687,683)
5	Septicemia 312	Malignant Neoplasms 321	Accidental Drowning 164	Congenital Anomalies 324	Accidental Poisoning 566	Malignant Neoplasms 768	Heart Disease 3,160	HIV 5,867	Chronic Lwr. Resp. Dis. 14,490	Influenza/ Pneumonia 55,518	Diabetes 71,372	Chronic Lwr. Resp. Dis. 4% (1,444,745)
6	Influenza/ Pneumonia 299	Heart Disease 200	Homicide 133	Accidental Drowning 293	Heart Disease 398	Heart Disease 543	Accidental Poisoning 2,507	Accidental Poisoning 5,036	Chronic Liver Disease 13,009	Diabetes 53,707	Influenza/ Pneumonia 62,034	Suicide 3% (1,079,822)
7	MV Traffic Crashes 139	Exposure to Smoke/Fire 170	Heart Disease 82	Heart Disease 273	Accidental Drowning 326	Accidental Drowning 211	HIV 2,101	Homicide 4,268	Suicide 9,259	Alzheimer's 53,245	Alzheimer's 53,852	Perinatal Period 3% (1,070,154)
8	Nephritis/ Nephrosis 133	Septicemia 96	MV NonTraffic Crashes 51	Exposure to Smoke/Fire 140	Congenital Anomalies 244	Congenital Anomalies 206	Stroke 601	Chronic Liver Disease 3,336	MV Traffic Crashes 8,750	Nephritis/ Nephrosis 33,121	MV Traffic Crashes 42,443	Diabetes 3% (1,014,201)
9	Stroke 108	Influenza/ Pneumonia 92	Benign Neoplasms 46	MV NonTraffic Crashes 125	Accidental Falls 114	HIV 167	Diabetes 595	Stroke 2,491	HIV 5,437	Septicemia 25,418	Nephritis/ Nephrosis 39,480	Homicide 3% (924,263)
10	Meningitis 78	Perinatal Period 63	Septicemia 33	Chr. Lwr. Resp. Dis. 102	Acc. Dischg. of Firearms 114	Accidental Falls 134	Congenital Anomalies 458	Diabetes 1,958	Nephritis/ Nephrosis 5,106	Hypertension Renal Dis. 16,397	Septicemia 32,238	Chronic Liver Disease 2% (623,998)
ALL	27,568	4,288	2,703	6,672	15,851	14,940	41,683	91,674	412,204	1,798,420	2,416,425	All Causes 100% (36,866,317)

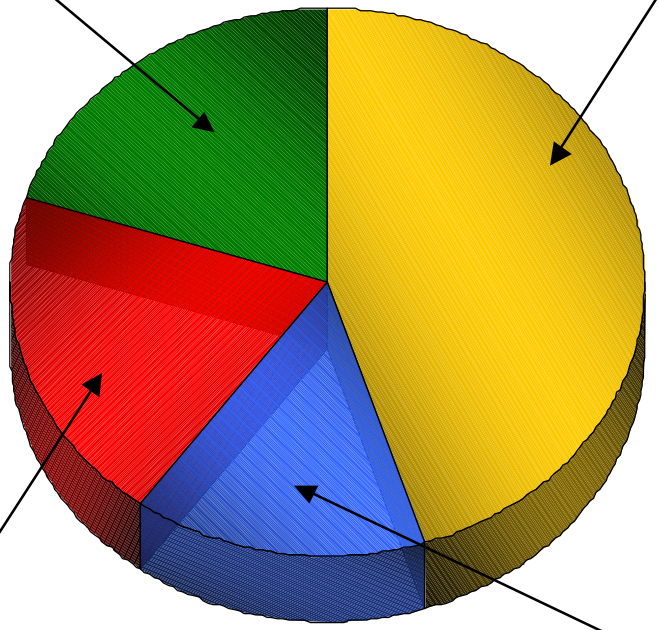
How People Die
on the US Roadways

Single Vehicle 20%

- Front 13%
- Side 5%
- Other 2%

Multi-Vehicle 45%

- Frontal 25%
- Side 17%
- Rear 3%



~117/day

42,643
Deaths in 2003

Single Vehicle Rollover 20%

- Pass Car 10%
- Light Truck 9%
- Heavy Truck 1%

Non-Occupant 15%

- Pedestrian 13%
- Pedalcyclist 2%

Source: FARS Census

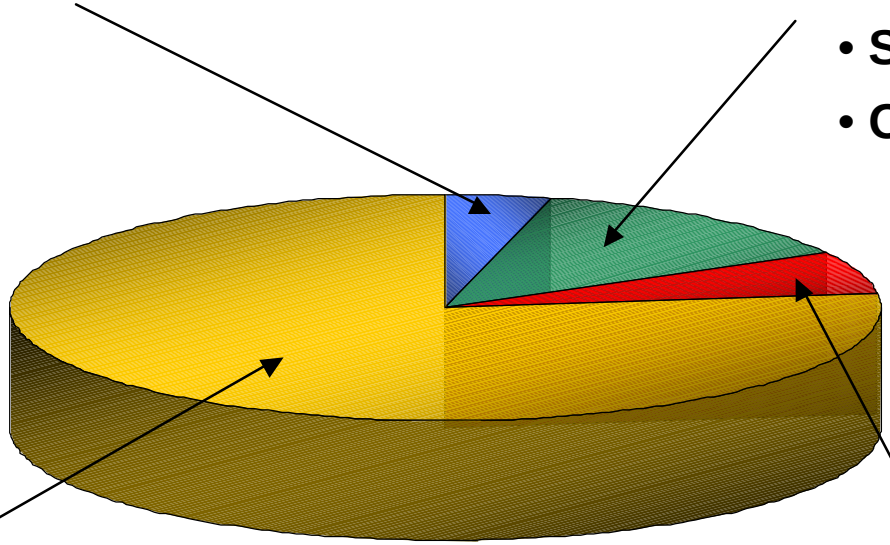
Traffic Injuries in the US

Non Occupant 4%

- Pedestrian 2%
- Pedalcyclist 2%

Single Vehicle 13%

- Front 9%
- Side 3%
- Other 1%



~8,000/day

~2.9 million
Injured in 2003

Multi-Vehicle 77%

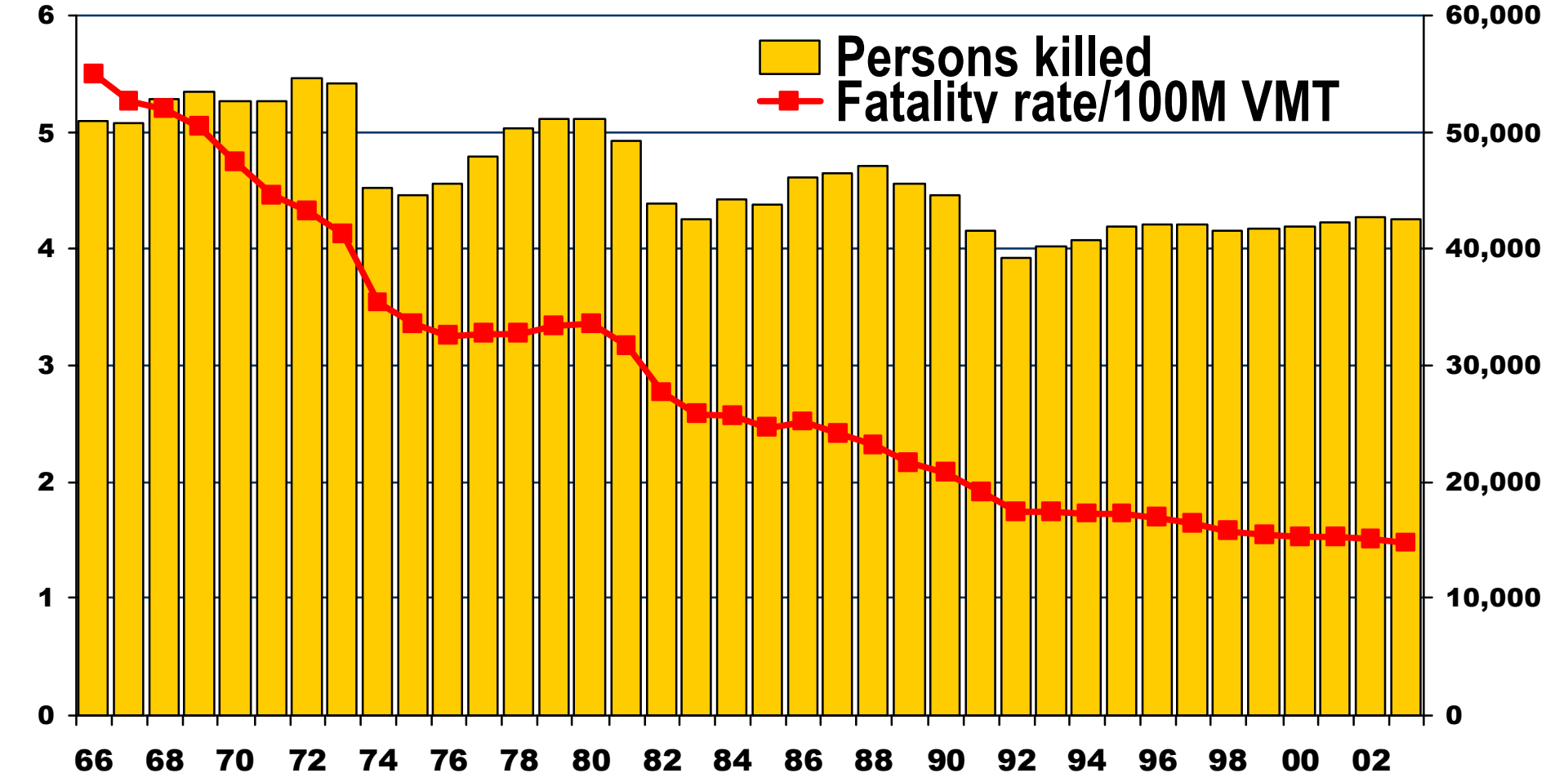
- Front 31%
- Side 25%
- Rear 21%

Rollover 6%

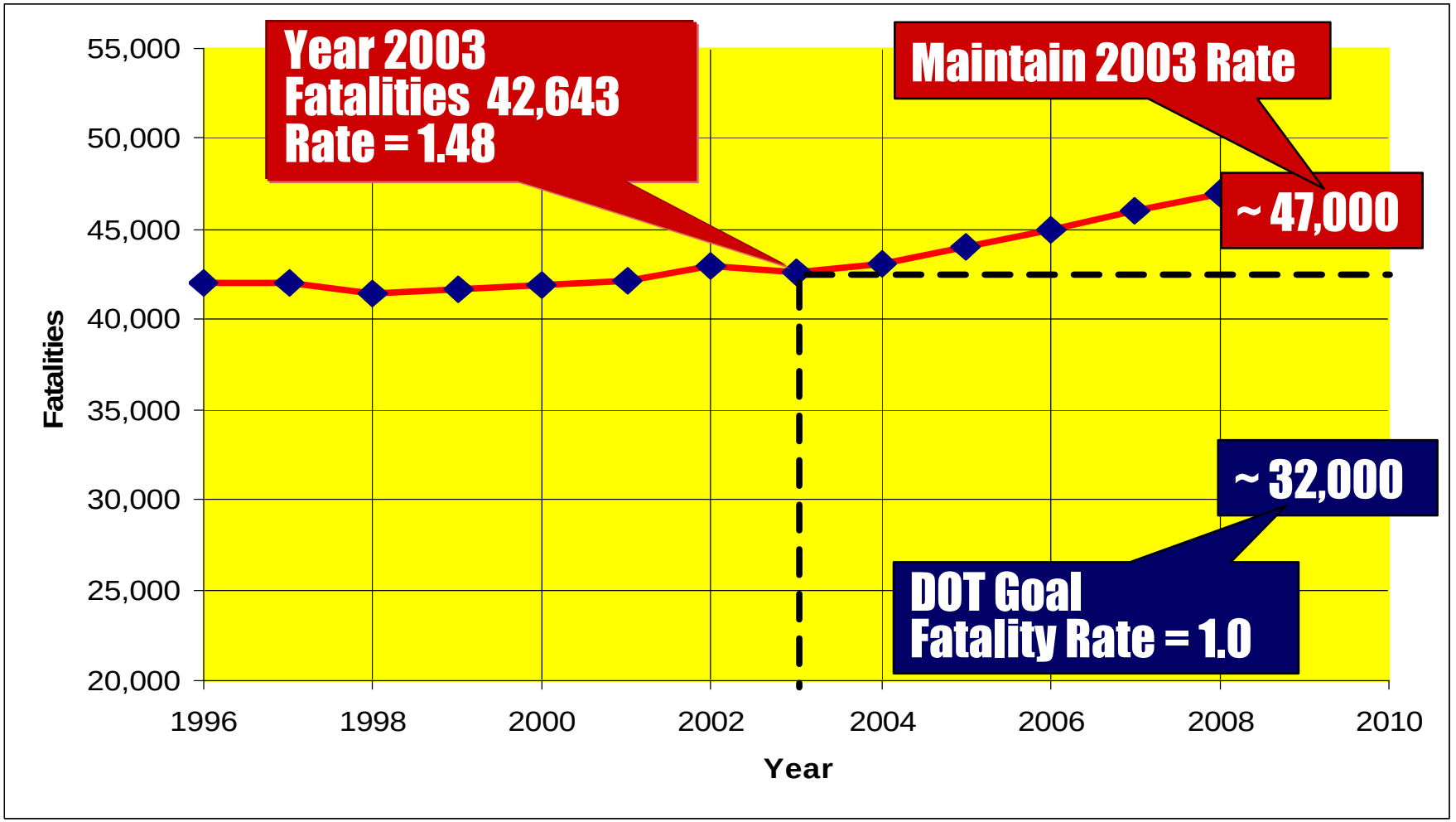
- Pass 3%
- Light Truck 2%
- Heavy Truck 1%

Source: NASS GES - 0.7% Sample

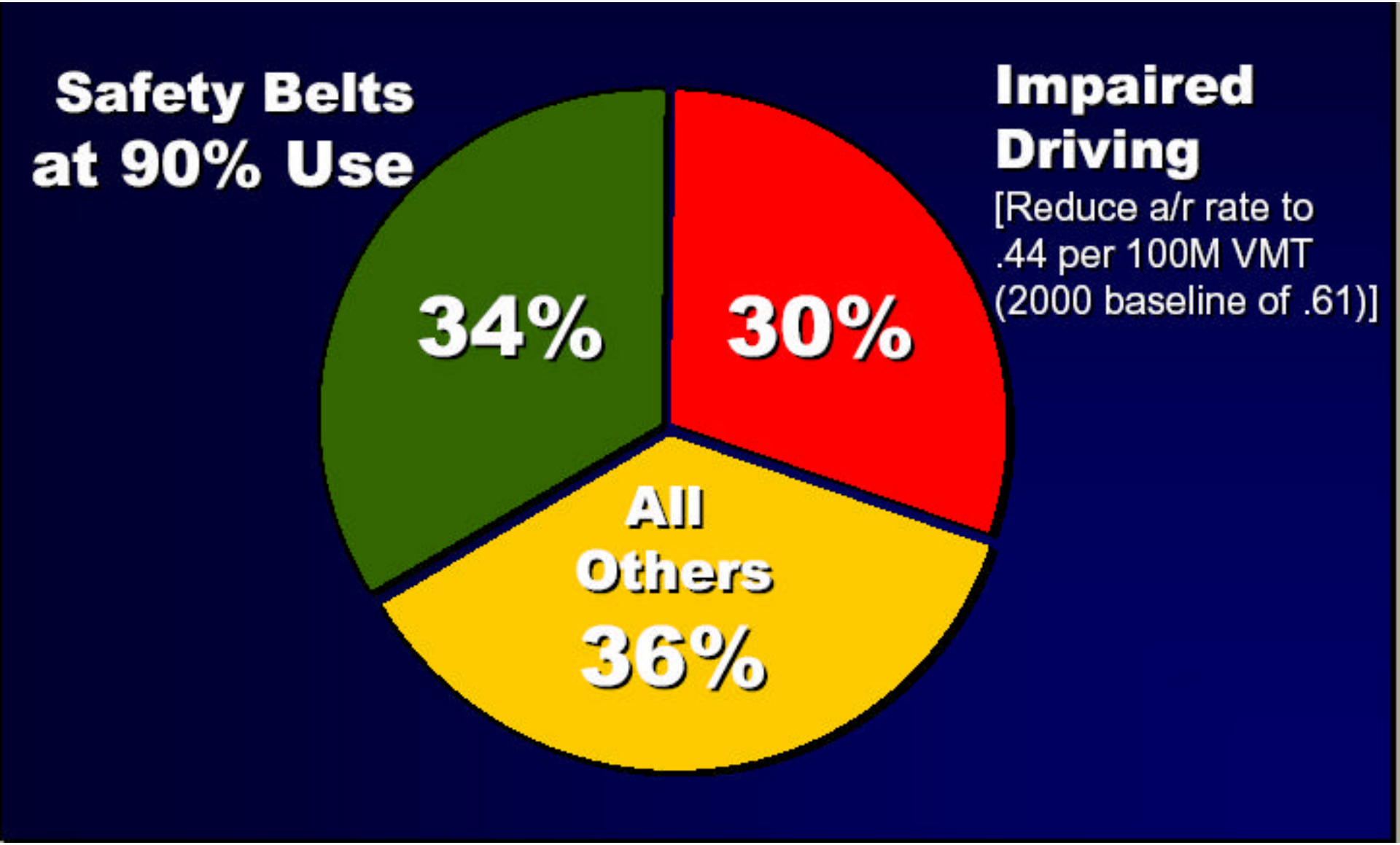
Persons Killed and Rate
Per 100M VMT in US



2008 Goal is Challenging



Predicted Lives Saved
by Countermeasure



NHTSA Priorities

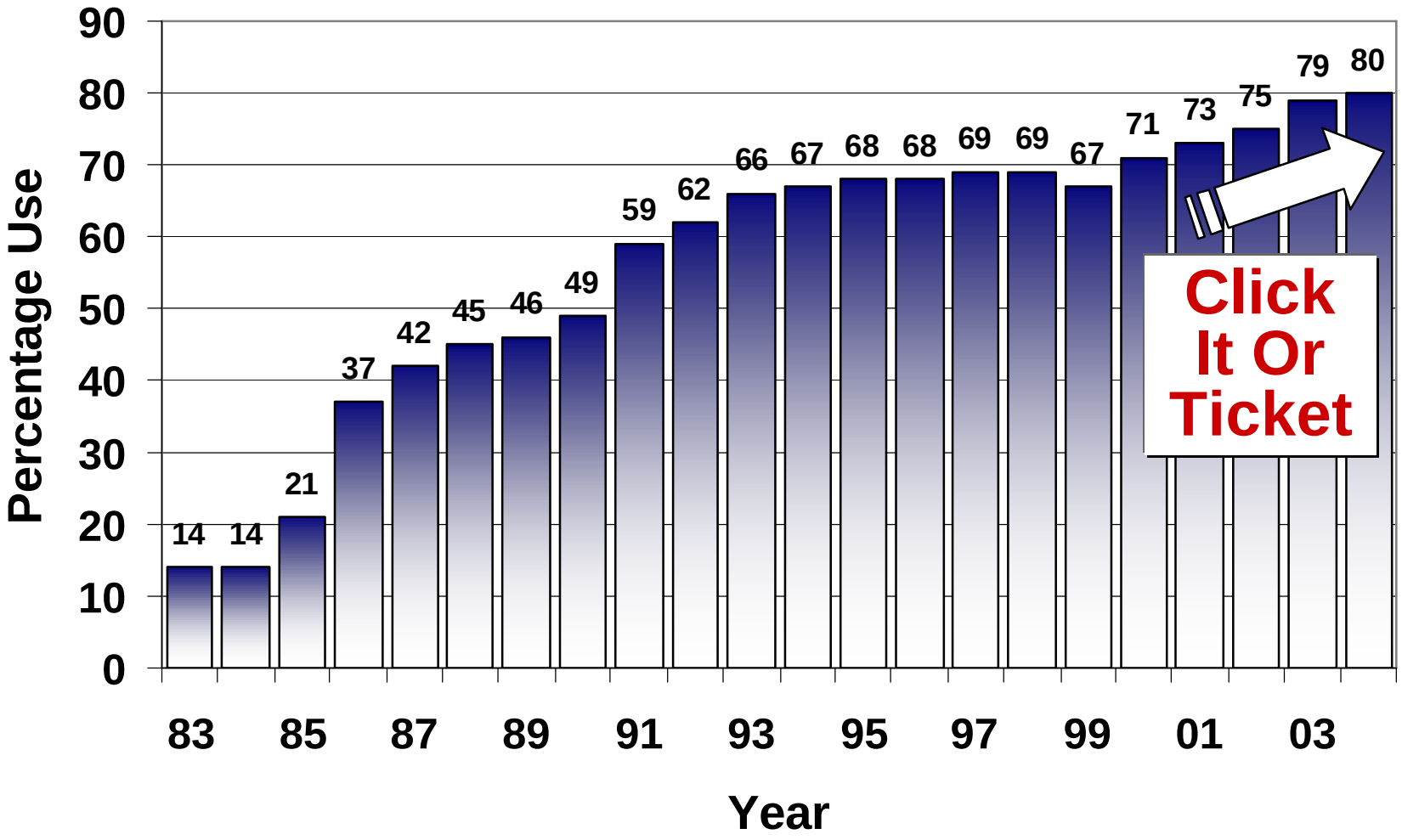
- **Safety Belt Use**
- **Impaired Driving**

} **Driver/Occupant Programs**

- **Data Quality**
- **Vehicle Compatibility**
- **Rollover Mitigation**

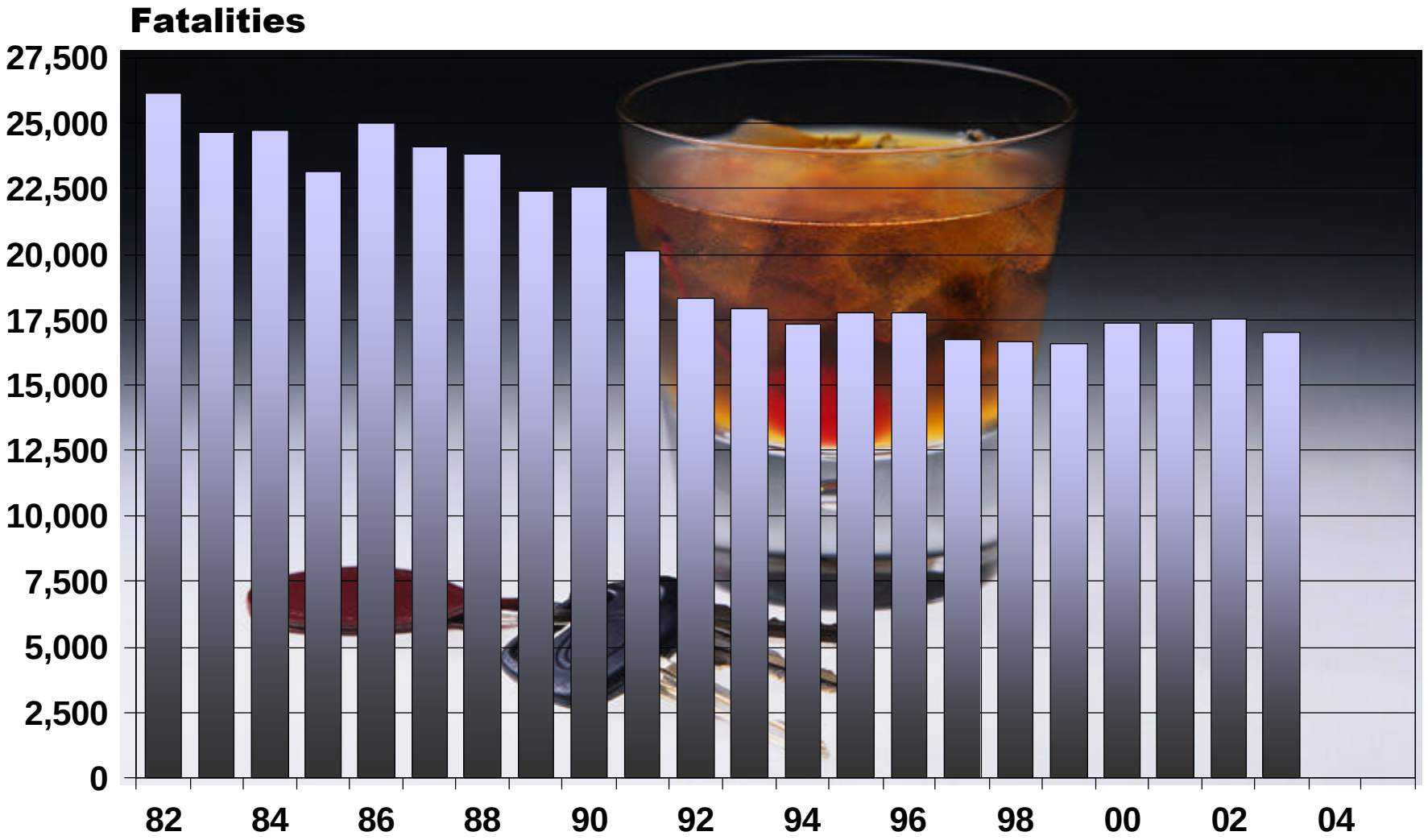
} **Vehicle Programs**

Safety Belt Use Rates in US



1% Increase in Belt Use Saves 268 Lives in US

Alcohol-Related Fatalities Trend



Strategies for Reducing Impaired Driving

High Visibility Enforcement

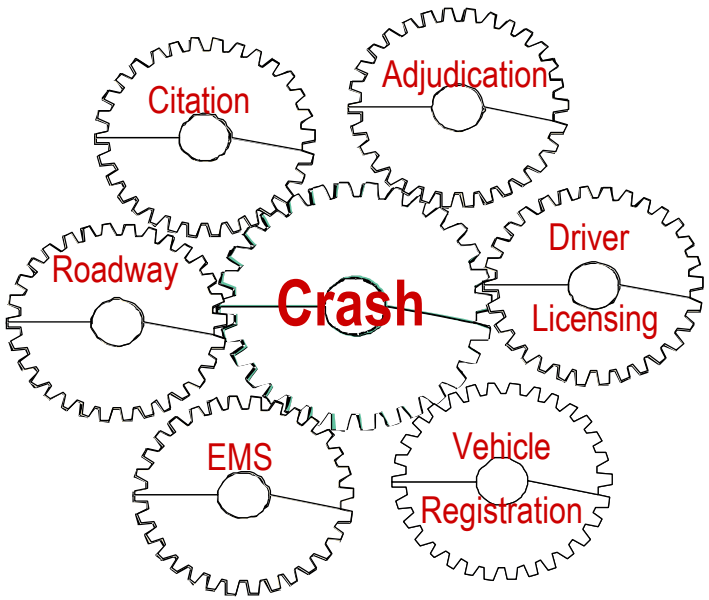
DWI Courts & Special Prosecutors

Screening & Brief Intervention

Primary Safety Belt Laws

Data Improvement

- **Uniform data**
- **Collected, edited, integrated, and transferred electronically.**
- **Enable tracking of a traffic safety event in a timely manner**
- **Multi level: Local, State and Federal**

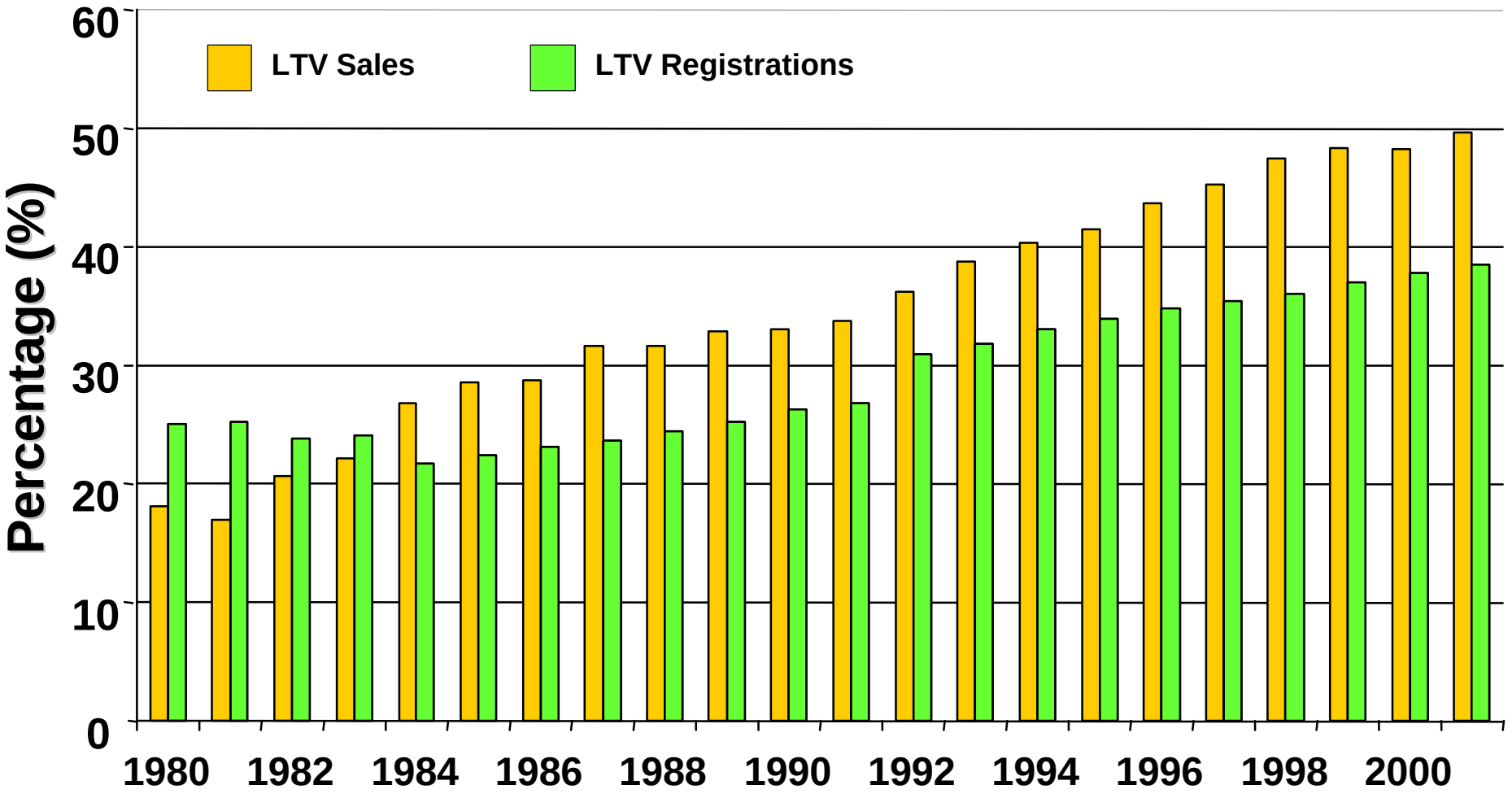


State Safety Data

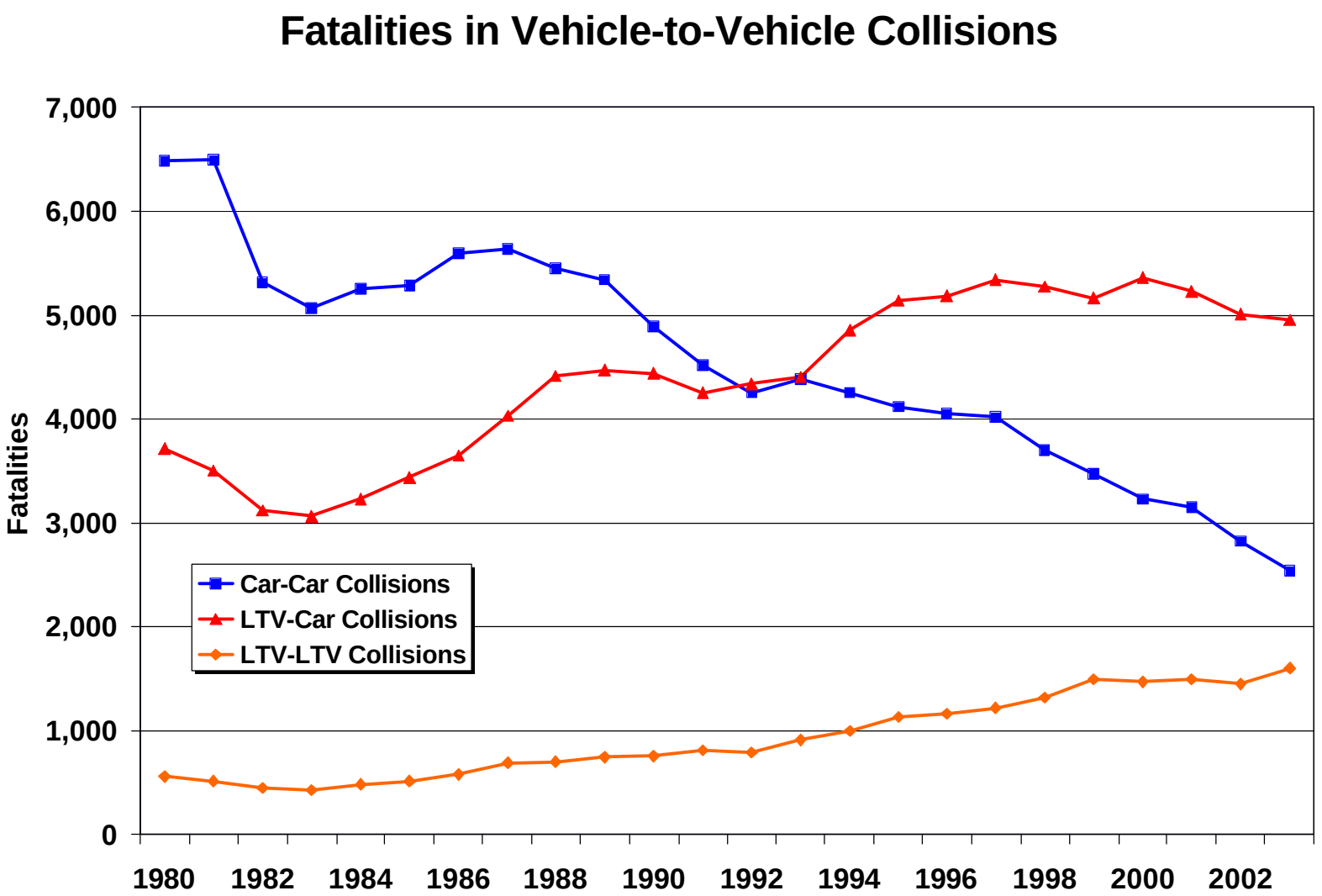
Event Data Recorder

- **A device that is installed in a motor vehicle**
- **Records technical vehicle and occupant-based information**
- **Commonly called EDR's**
- **Function**
  1. Detects potential crash events
  2. Senses pre-crash parameters
  3. Stores crash data
  4. Plays back collected data

Compatibility Problem
US LTV sales - leveling off at just under 50%

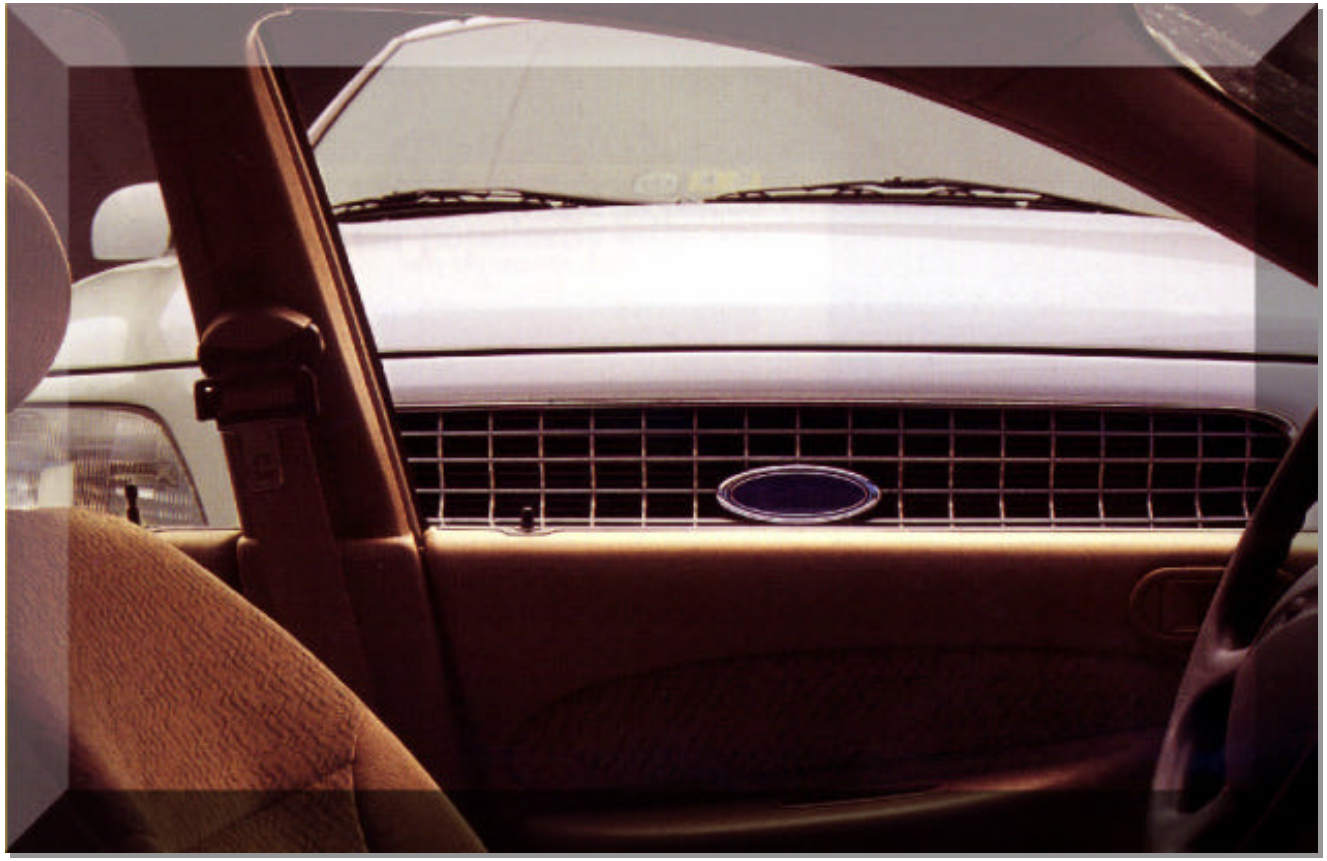


Compatibility Problem



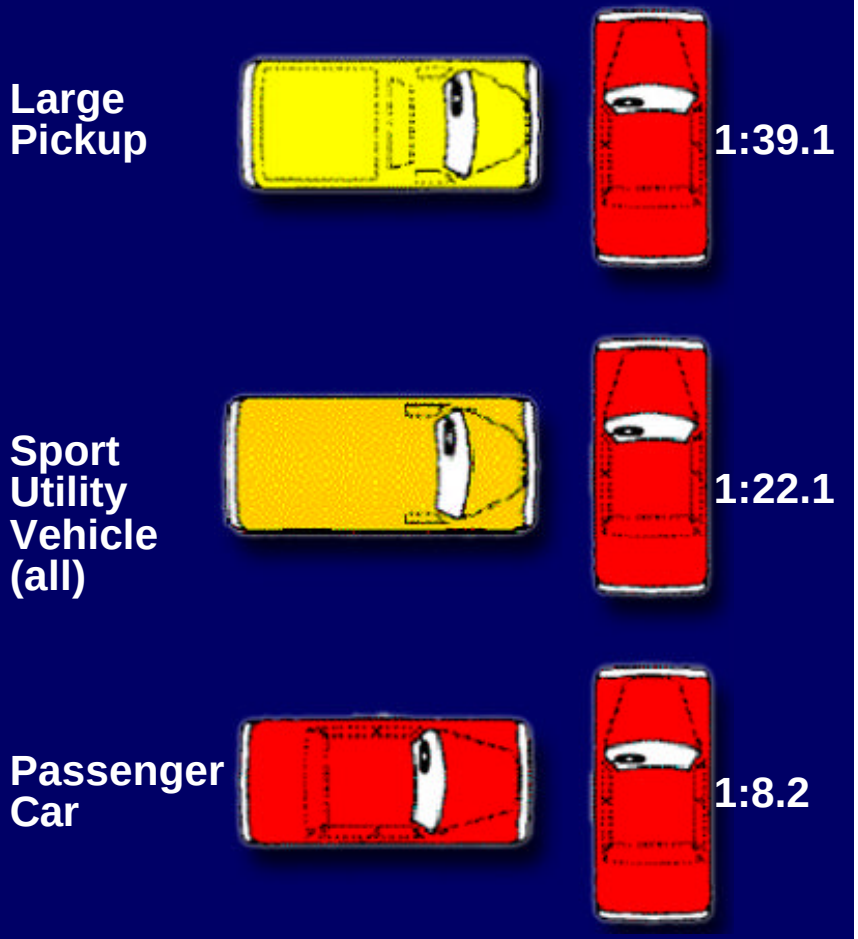
Vehicle Compatibility

Vehicle Compatibility



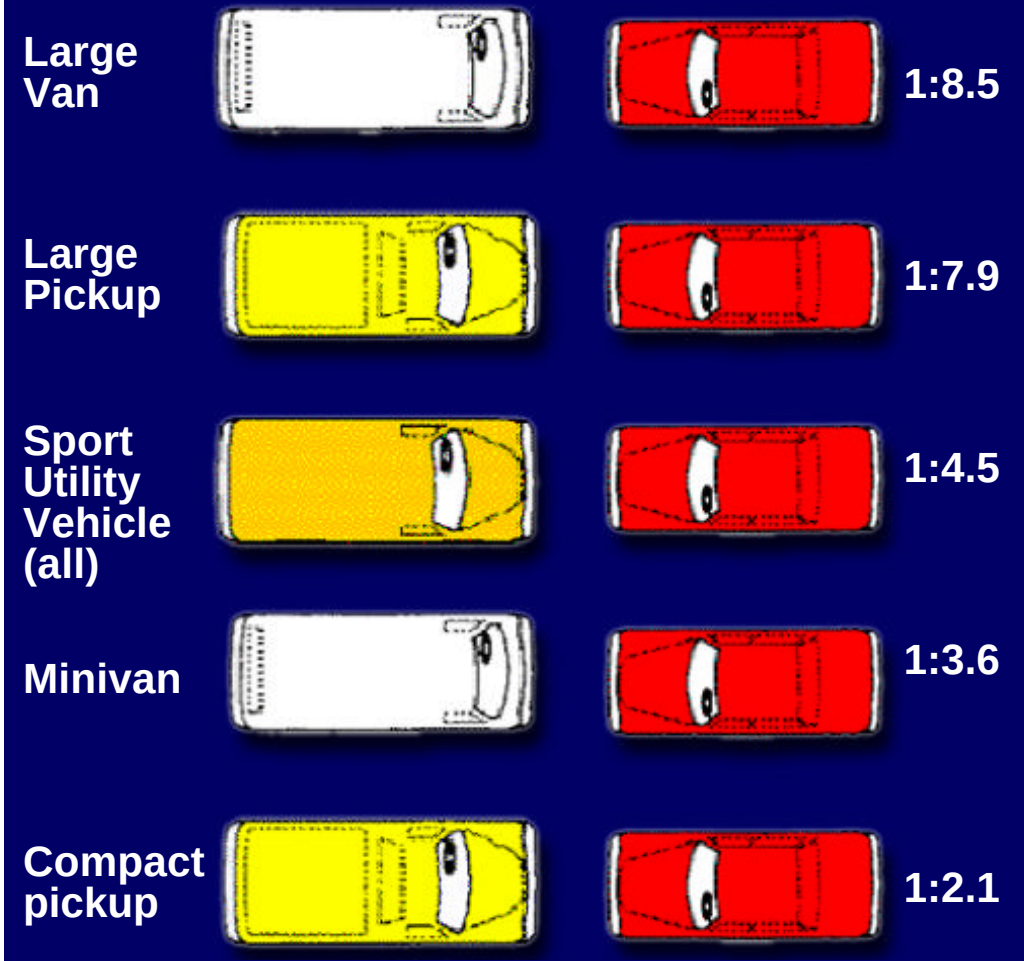
Driver Fatality Ratios

for Side Impact Crashes into Passenger Cars



Driver Fatality Ratios

for Frontal-Frontal LTV-to-Car Crashes



1995-2001 FARS, Driver Fatality Ratios Both Vehicles MY >= 1990

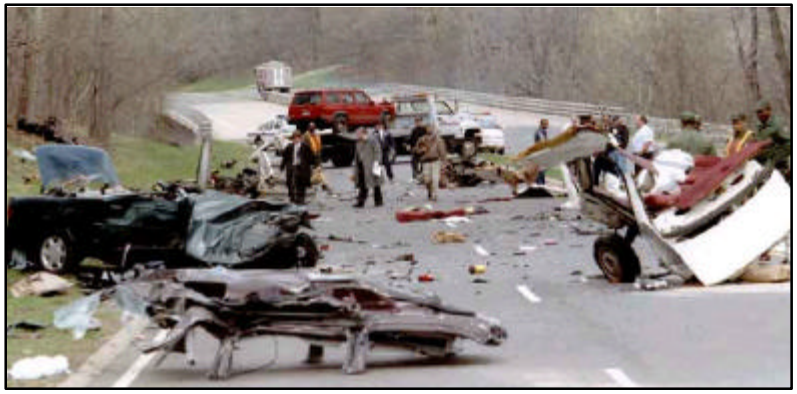
Alliance Compatibility Commitments

- **Front to Side**
  - Sept 2007 - 50% of vehicles meet either
    - FVMSS 201 Pole, HIC_{36} < 1000 for SID H3 driver

      OR
    - IIHS Side impact, HIC15 < 779 for SID2s driver
  - Sept 2009 - 100 % of vehicles meet IIHS requirement
- **Front to Front**
  - Sept 2009 All light trucks will have either
    - Primary Energy Absorbing Structure will overlap 50 % of Part 581 zone OR If this criteria can not be met
    - Secondary Energy Absorbing Structure will be Designed to Reduce Over-ride
- **Additional Research Planned On Dynamic Test Protocol and Front-end Stiffness Performance**

Rollover in US

- **R/O NCAP**
  - Static stability factor
  - Dynamic test
  - Linked to statistics
- **Strategies**
  - Prevent the crash
  - Prevent the rollover
  - Prevent the ejection
  - Reduce the severity



Technical Innovation
Programmable Steering Machine

Evaluating R/O
Fishhook Maneuver

Our Preliminary Analysis on ESC Benefits

Effectiveness of ESC

State Data (5 states)	Percent Reduction for Single Vehicle Crashes
Vehicle Type	
1997 – 2002 Single Vehicle Crashes	
Passenger Cars	35%
SUV's	67%
1997 – 2003 Fatal Single Vehicle Crashes	
Passenger Cars	30%
SUV's	63%

Solving Problems

Why Advanced Technologies?

- **Technologies offer new opportunities**
- **Potential for total safety benefits**
- **Save lives, prevent/mitigate injuries and reduce the economic costs**

Crash Time line

Prevention

Protection

0

m.sec.

100

Severity Reduction

Crash Prevention

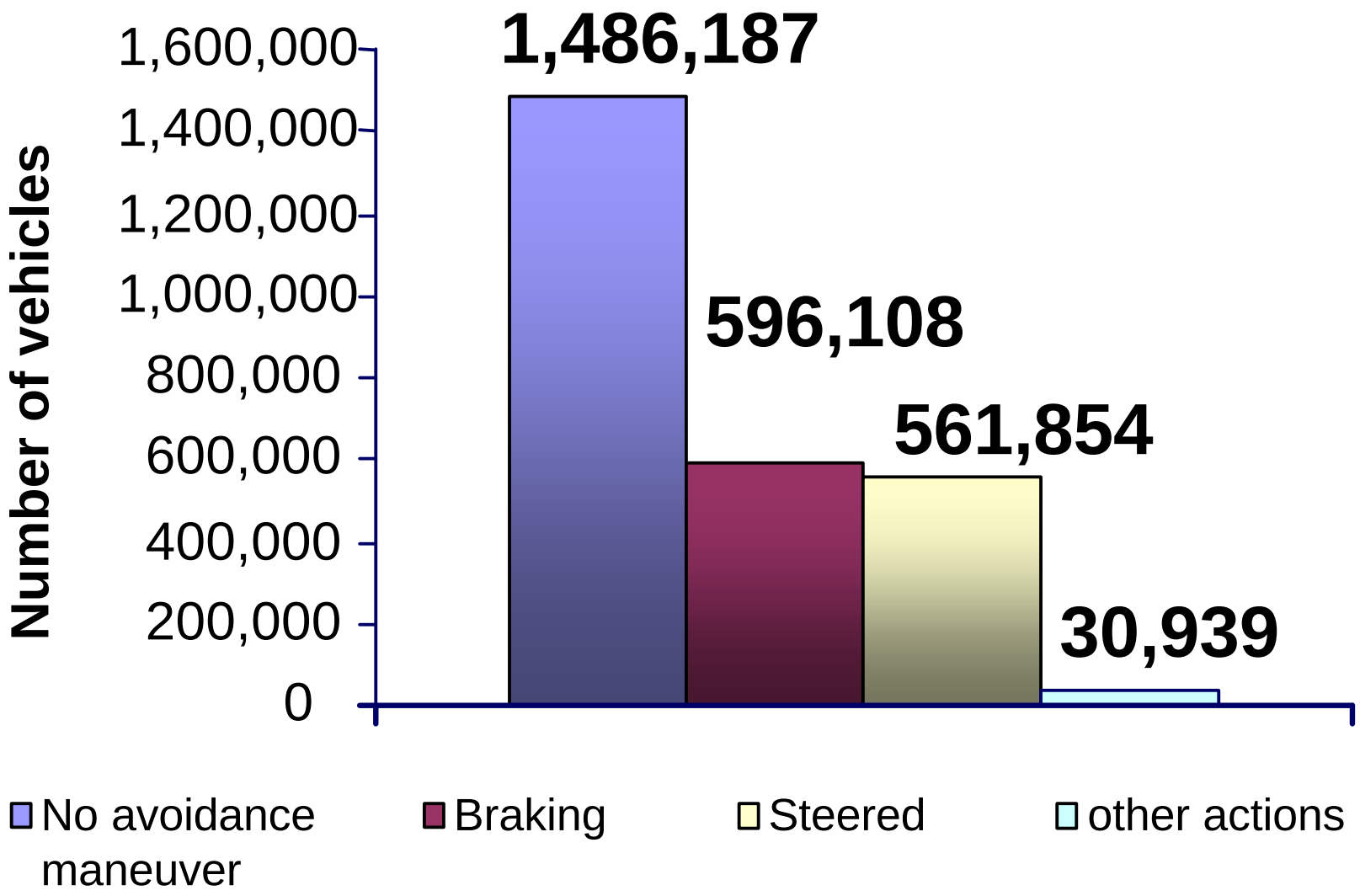
TECHNOLOGIES												
HAZARD	Night Vision System	Adaptive Cruise Control	Electronic Stability Control	Brake Assist	Traction Control	Roll Stability Advisor	Roll Stability Control	Curve Over Speed	Drowsy Driver Alert	Other Specify	Other Specify	Other Specify
Run-off-road Crashes												
Intersections Crashes												
Frontal Crashes												
Non-motorist												
Rollover												
Elderly Driver												
Young Driver												
Inexperienced Driver												
Impaired Driving, Drugs, Alcohol												
Impaired Driving, Distraction												
Speeding												
Inclement Weather												
Reduced Visibility, Darkness (pedestrian)												
Impaired Driving, Drowsiness												
Reduced Visibility, Fog												
Animal in Road (nighttime)												

Injury Mitigation

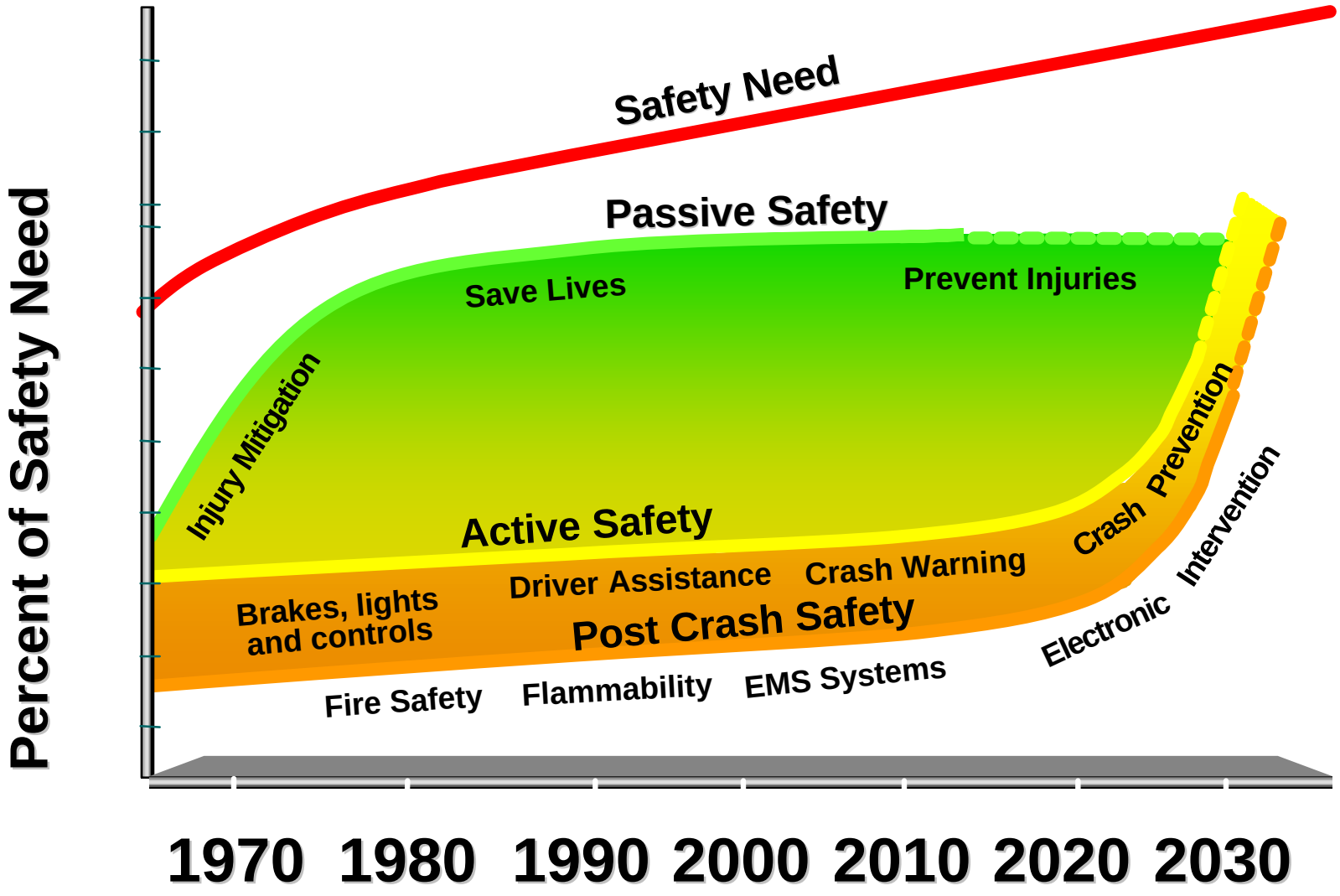
TECHNOLOGIES												
HAZARD	Advanced Seatbelt & Airbag	Ext of ESC & RO Control	Automatic Braking		Other Specify	Other Specify	Other Specify					
Frontal Crashes												
Rollover												
Restraint Use												
Compatibility												
Elderly Driver												
Impaired driving												

Opportunities

Crashes by Avoidance Maneuver in the US



The Safety Need



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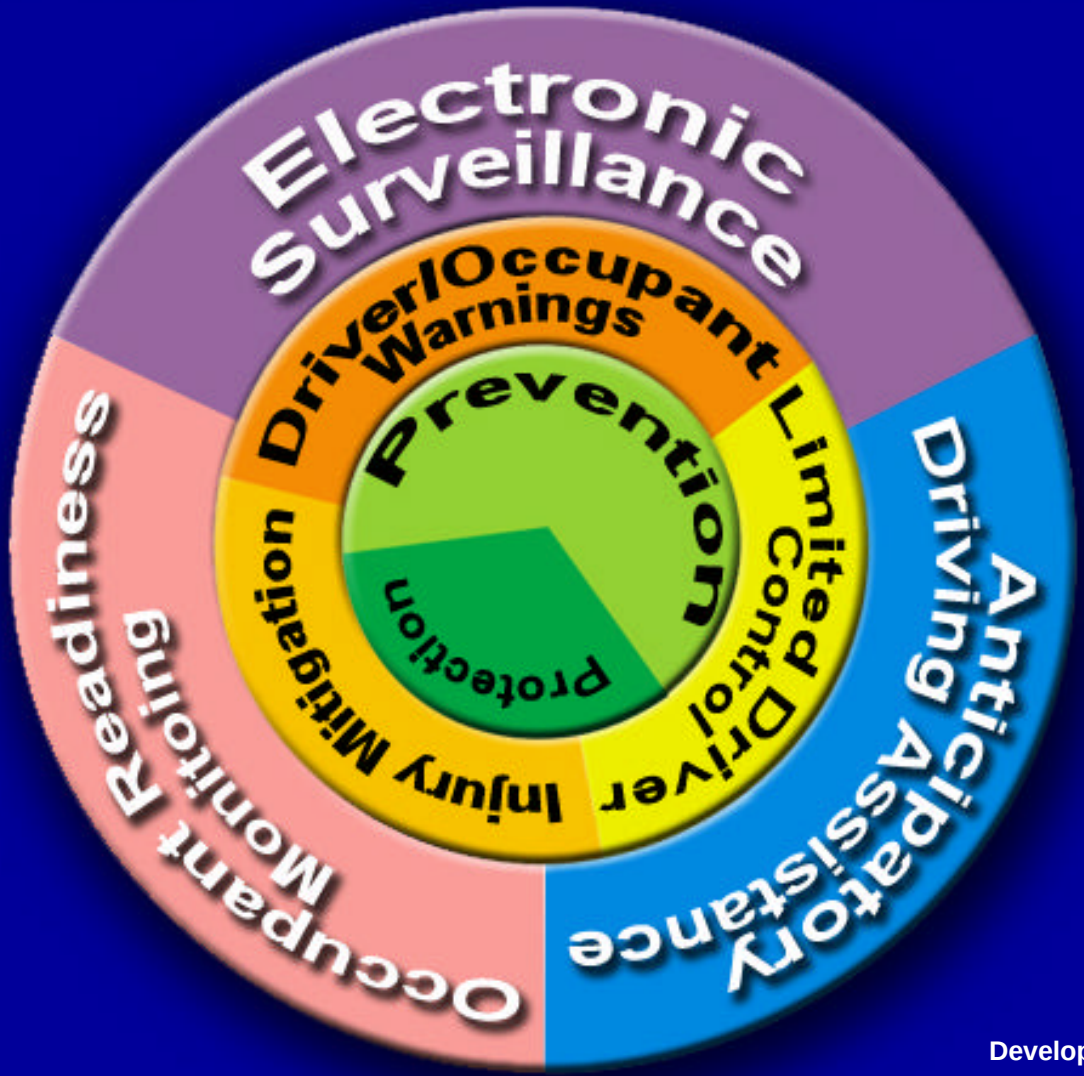
Total Safety



Developed by: Joseph N. Kanianthra

Deploying Active Safety Technologies

- **How to accelerate deployment?**
  - Collaborative research
  - Estimate safety benefits and show feasibility
  - Develop performance specifications and objective tests
  - Use market forces & consumer information